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# DOTHICHIZA POPULEA IN THE UNITED STATES

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(With Plates 194 and 195, Containing 6 Figures)

## A New Fungus Outbreak in the United States

The black poplar (*Populus nigra* L.), especially the variety known as the Lombardy poplar, is one of our most beautiful ornamental trees. It is, however, subject to diseases which shorten its life. In the United States these diseases apparently have not been studied to any extent, as there is a lack of literature on the subject. During the spring of 1916, many reports were received by the United States Department of Agriculture concerning a serious blight of newly transplanted black poplars. In one instance, every tree in a lot of thirty was killed back by cankers. In a second instance, nearly all of 630 trees were badly infected with cankers, and at least one fourth of them were killed back to the point of the infection.

An examination of cankers from the trees mentioned above and from other localities showed that in a great majority of cases only one fungus was present in the cankers. This fungus has been isolated and studied. Morphologically it is identical with *Dothichiza populea* Sacc. & Briard.

A number of nurseries in the eastern United States have been examined with reference to the presence of this disease. In some instances, varieties of the black poplar were found very much diseased, thus accounting for the specially bad outbreak among recently transplanted nursery stock. It was also ascertained that in a number of localities adjacent to the infected nurseries nearly all the black poplars and some of the Canada poplars, or cottonwoods (*Populus deltoides* Marsh), had been attacked by the disease.

At the same time a hasty preliminary survey was made of several localities for the presence of the disease on poplars planted for shade or ornament. In some of these localities, black poplars, mostly recently planted, were found to be seriously diseased. In three cases only, a few large trees were found, not only of the black but also of the Canada poplar, which had apparently been diseased for several years. A future study of the cankered areas on the trunks of these trees will probably establish approximately the date of their formation.

In 1915 two specimens of diseased black poplar were sent by Joseph L. Richards to the Plant-Disease Survey of the Department of Agriculture, one from West Lynn, Mass., and the other from Hanover, N. H. Both specimens have since proved to be attacked by *Dothichiza populea.* Mr. Richards reported a badly diseased condition of poplars in both localities in 1915.

## EARLIER OUTBREAKS OF THE FUNGUS IN EUROPE

*Dothichiza populea* was first described and named in 1884 by Saccardo and Briard (**4**: 672),[1] who reported the fungus as occurring as a saprophyte on the dead branches of *Populus* at Troyes, France.

Krieger[2] later distributed specimens of *Dothichiza populea* collected on limbs of *Populus nigra* near Königsten, Saxony, March 28, 1893, one of which has been examined by the writers.

Delacroix (1), in 1903, was the first to make a careful study of *Dothichiza populea* and to note its real effect on poplars. He not only ascertained that the fungus was parasitic in its nature, but also that it was the cause of a serious disease in France. Among the varieties of poplars attacked, he mentions *Populus virginiana* (a synonym for *Populus deltoides*), *Populus nigra,* and *Populus bolleana.* The disease was found in a number of localities and had been observed for several years previous to the time of publication. In 1906 (2), he published an additional article on the disease, adding to the data on its distribution and to the knowledge of the fungus, at the same time giving directions for its control.

Voglino, in 1907 (**6**: 193, 196), reported *Dothichiza populea* as causing a disease of Canada poplars near Turin and in other localities in Italy. In 1910 (7: 285–287) and 1911 (**8**: 325–337) he published additional articles, which contain the results of a lengthy investigation of both the disease and its causal fungus. He reported proof both by cultural studies and by inoculations that *Dothichiza populea* Sacc. & Briard is the pycnidial form of the ascomycete *Cenangium populneum* (Pers.) Rehm. He found that the fungus is the cause of a very serious disease of poplars, especially the Canada poplar, in various parts of Italy.

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[1] The figures in parentheses refer to "Literature cited" at the end of this paper.

[2] Krieger, K. W. Fungi Saxonici Exsiccati. No. 1100. Konigstein.a.E., 1895.

From the foregoing data, it appears quite possible that *Dothichiza populea* has been imported, though not very recently. A great quantity of nursery stock has been brought to this country from Europe, and the fungus could easily have been brought in previous to the enforcement of the present inspection laws.

On the other hand, the fact that this disease has not been reported previously from this country by any of the state pathologists and that earlier specimens of *Dothichiza populea* have not been collected by the pathologists of the United States Department of Agriculture indicates that it is a somewhat recent disease in the United States.

This assumption is further strengthened by the absence of *Dothichiza populea* from the exsiccati that have been collected in this country and the fact that there is apparently no mention of it in our literature.

## DESCRIPTION OF THE DISEASE CAUSED BY DOTHICHIZA POPULEA

*Dothichiza populea* attacks the trunk, limbs, and twigs of both the black and the Canada poplars. It primarily causes the formation of cankers, which at first appear as depressed, slightly darkened areas in the bark, usually on the trunk around the base of a small limb or twig (*pl. 194, f. 2, 3*). The cambium is killed and turns brown (*pl. 195, f. 3*). Pustules of the fungus soon appear on the canker, giving the surface a roughened appearance (*pl. 194, f. 2, 3*). In trees that have become well established in the soil a marked resistance of the host to the fungus frequently takes place. In such cases the growth of the fungus is checked, the canker limited to a small patch of varying shape and size, and the bark is frequently cracked at the edge of the canker by the rapid growth of the cambium in the callus that is now formed (*pl. 194, f. 2*). As the canker becomes older, the bark sloughs off, leaving an open wound on the trunk, surrounded by apparently healthy bark. Meanwhile, the fungus attacks the limb or twig around the base of which the canker was formed, spreading very rapidly through it, forming pustules over a large portion of the bark.

Cankers much like those on the trunk are frequently formed on the lower limbs and twigs of diseased trees. On the larger limbs, their formation and appearance are much like those on the trunk. When the fungus attacks smaller limbs and twigs the canker usually extends around each limb or twig and very soon kills it (*pl. 194, f. 1*).

In trees recently transplanted and in trees heeled in for early planting in the spring, the fungus spreads most rapidly. Transplanted trees may become badly diseased by cankers formed from fresh infections between October and the following May (*pl. 195, f. 1, 2*).

*Dothichiza populea* is the most rapidly growing canker-producing fungus known to the writers. One canker selected from a number produced on black poplars between October, 1915, and May, 1916, was twelve inches long and encircled the trunk of the tree for nearly two thirds of the length of the canker. In the same lot of trees, out of 100 examined 90 were diseased either in limbs or trunk, 27 were girdled at the trunk by cankers which had killed the tops of the trees, and 13 more had distinct trunk cankers which had not yet encircled the trunks.

*Dothichiza populea* causes but slight outward discoloration of the bark in the cankers it produces, the color being slightly darker. The fruiting bodies (pycnidia) of the fungus are formed beneath the surface of the bark and cause marked elevations or pustules to appear on the cankers soon after they develop (*pl. 195, f. 1, 2*). These pustules are smooth on the surface at first and have the same color as the adjacent bark. At maturity they rupture near the center of the top and small cream-colored tendrils are exuded, which gradually assume a tawny olive to a walnut-brown color. These are composed of millions of pycnospores, which spread the disease to adjacent trees. According to

Delacroix, these spores are wind disseminated; but as they are in a somewhat sticky mass at first, insects or birds might carry them, as in the case of the chestnut-blight fungus (*Endothia parasitica* (Murrill) Anderson & Anderson) as reported by Heald and Studhalter (3), and Studhalter and Ruggles (5).

## EFFECT OF THE DISEASE ON POPLARS

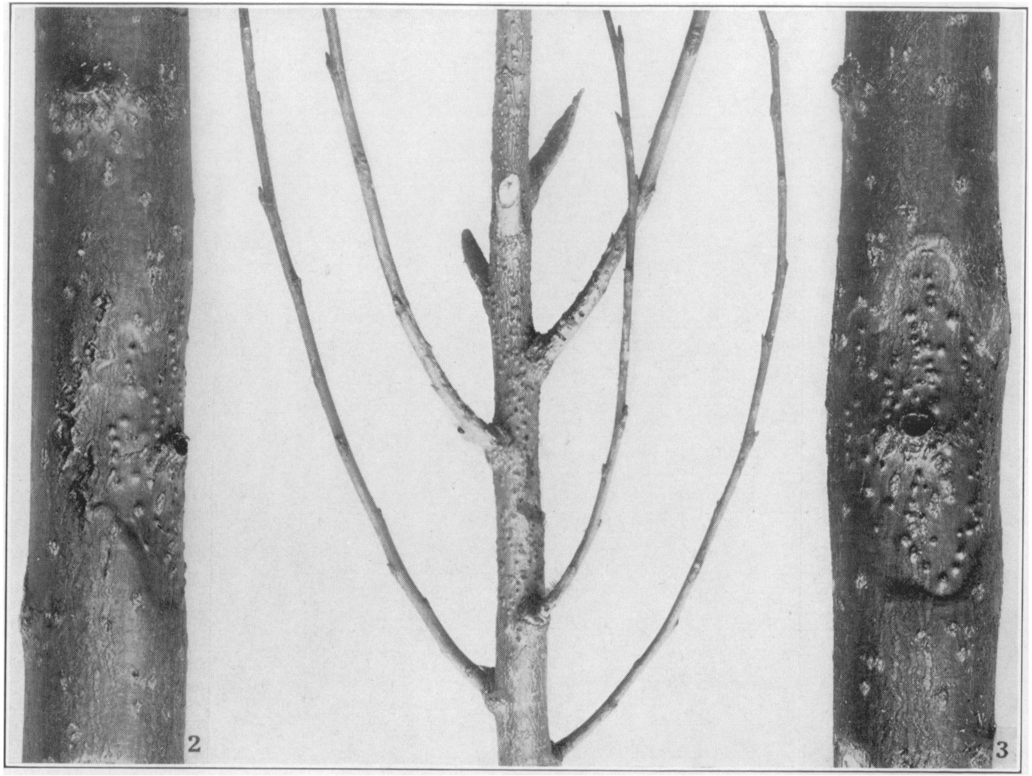
*Dothichiza populea* at first kills a few limbs here and there on younger trees in the nursery rows. The cankers on such trees, owing to the fact they are not conspicuous at first, are easily overlooked. When the disease becomes well established many of the lower limbs are killed and rapidly growing sprouts are sent up from the bases of the trees below the cankered areas. These sprouts, though vigorous, are soon infected by the fungus and are likely to be removed and used for cuttings, under the impression that they are healthy.

On older trees in nursery rows and on well-established shade trees the lower limbs are killed by the fungus and scars are soon formed by cankers on the trunks, which are thereby rendered unsightly. At the same time tufts or clusters of rapidly growing sprouts are sent out near or below diseased areas. These in turn are killed by the fungus, which gradually spreads to all parts of the tree, finally killing it.

In case of freshly transplanted trees, the disease is much more virulent. Cankers may encircle either the trunks or main limbs of the trees, killing them. In the case of black poplars, the beautiful tapering cone-shaped outline of the tree is destroyed. Trees once attacked apparently never recover their former beauty, even where the dead parts have been carefully removed.

In France, Delacroix (2) reports the disease as especially severe on nursery stock and younger trees and of less importance on old-established trees. There, as in the United States, it destroys the beauty of the black poplars. It also causes considerable loss to growers of Canada poplars who raise the trees for saw logs.

The disease in Europe is reported both by Delacroix (1, 2) and by Voglino (6, 7, and 8) as especially severe on Canada poplars, but in the United States, so far, it has been found in a serious form only on black poplars.



DOTHICHIZA POPULEA SACC. & BRIARD

## DESCRIPTION OF THE FUNGUS

The following description of *Dothichiza populea* Sacc. & Briard is based on specimens from ten different collections from seven different states. The spore measurements are based on 100 spores, 10 from each collection.

*Pycnidia,* numerous in the bark, at first in pustules covered by the epidermis of the host, rupturing at the top when mature, the tops of the pustules later breaking away, leaving pseudo-acervuli, lens shaped to subspheroid before rupturing, often irregular in shape, ¾ to 1½ mm. in diameter; walls black, with irregular surface at the base on the inside; spore masses ejected in cylindric tendrils, usually short, creamy to tawny olive or walnut brown in color; spores subglobose to ovoid, or rarely ellipsoid, smooth, hyaline when viewed singly, smoky in mass; $9.5–17 \times 6.7–12.7\,\mu$, averaging $12.1 \times 8.6\,\mu$; germinating at the smaller or basal end.

Spores of *Dothichiza populea* from No. 1100, Krieger, Fungi Saxonici Exsiccati, on *Populus nigra,* measure as follows: $10.1–12.2 \times 7.3–10.2\,\mu$, averaging $11.6 \times 9.1\,\mu$. It must be noted that these spores were measured from dried material mounted in water, while those on which our description is based contain the measurements from five fresh specimens, three partially dried specimens, and two thoroughly dried specimens. The dried specimens yielded slightly smaller measurements.

## DISTRIBUTION OF THE FUNGUS

*Dothichiza populea* has been collected in the United States on the following hosts:

### *Populus nigra*

New Hampshire: Hanover, by J. L. Richards, June, 1915 (P.D.S.[3] 662).

Massachusetts: West Lynn, by J. L. Richards, June, 1915 (P.D.S. 611).

New Jersey: Morrisville, by George G. Hedgcock, June, 1916 (F.P.[4] 22353).

Pennsylvania: Delaware Water Gap, by N. M. Goodyear, May, 1916 (F.P. 22362). By George G. Hedgcock in 1916, West

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[3] P.D.S., Plant-Disease Survey.

[4] F.P., Forest Pathology.

Chester (F.P. 22369, 22370, 22371, 22372, and 22373); Frazer (F.P. 22374); Wayne (F.P. 22378); Wynnewood (F.P. 22381); Rosemont (F.P. 22382); Haverford (F.P. 22393); Allen Lane (F.P. 22391); Chestnut Hill (F.P. 22385, 22387); also by S. B. Detwiler (F.P. 22395).

Delaware: Wilmington, by G. S. Mattingly, May, 1916 (F.P. 22281); by George G. Hedgcock, June, 1916 (F.P. 22357, 22358, and 22359).

Maryland: Baltimore, by J. A. Byrne, May, 1916 (F.P. 20877); by George G. Hedgcock, May, 1916 (F.P. 22303).

Ohio: Cincinnati, by George G. Hedgcock, June, 1916 (F.P. 22316).

New Mexico: Estancia, by F. C. Werkenthin May, 1916 (F.P. 22363 and 22364).

*Populus deltoides*

In Pennsylvania: By George G. Hedgcock, June, 1910, Berwyn (F.P. 22377); Wayne (F.P. 22379); Chestnut Hill (F.P. 22388); Haverford (F.P. 22393).

From the foregoing, it will be seen that the fungus has been widely distributed in the United States, since its present known range is from New Hampshire to New Mexico. However, a preliminary survey indicates that many localities are free from the disease.

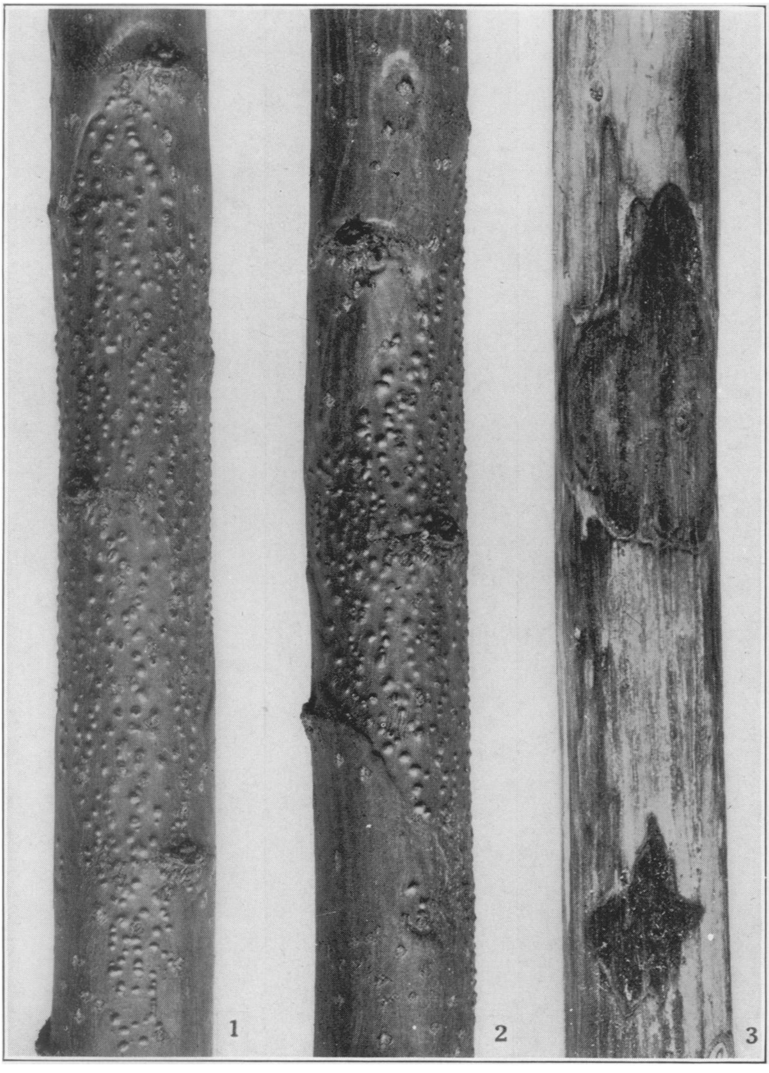
*Dothichiza populea* has been reported from Europe as follows:

In France, according to Delacroix (1), *Dothichiza populea* was well established as early as 1903. He reported it at that time in Monterau (Seine et Marne), Villeneuvre-la-Guyard (Yonne), Montauban, Agen, and Paris.

In Italy, according to Voglino (8), Cavaglia in 1901–1902 noted cankers, apparently caused by *Dothichiza populea,* on Canada poplars near Santena. In 1906 Zoppa noted the disease near Crema. In 1907 Voglino, in addition to the localities previously mentioned, received numerous reports of the disease from various regions in Italy, as well as from Sardinia and from Switzerland.

In Germany no outbreaks of the disease have been reported.

The writers so far have not found *Cenangium populneum* (Pers.) Rehm on poplars in the territory investigated, either



DOTHICHIZA POPULEA SACC. & BRIARD

alone or in association with *Dothichiza populea* Sacc. & Briard. The relationship of the two fungi in the United States will be made the subject of further investigation. It has, however, been collected on *Populus tremuloides* as follows: At Middlebury, Vt., by E. A. Burt, April, 1896,[5] and at Orono, Maine, by P. L. Ricker, May 14, 1898.[6]

## SUGGESTIONS FOR THE CONTROL OF THE DISEASE

This disease apparently has its main centers of infection in our nurseries, and it is here that the first work of control should begin. All poplar trees that are blighted in the twigs or limbs or that show cankers should be dug out and burned. It will be better for the nurseryman to err on the side of caution than to allow this disease to gain a foothold in his nursery. A small infected twig on an otherwise healthy tree may infect all the trees in a bundle of transplants, and once infected the trees are ruined, as the fungus kills them back and spoils their beauty.

Poplars planted as ornamentals that become badly diseased should be dug up, removed, and burned. This treatment may seem to be severe, but in view of the fact that the disease appears to be a dangerous one it is the only safe course to pursue if it is to be exterminated. This disease has been under observation for a short time only, and no experiments for its control have been made.

Delacroix, among other suggestions, recommends the following treatment for the disease, but does not report its effect: The destruction of all diseased trees or diseased material; the disinfection of tools used in this work; the disinfection of the clothing and hands of workmen thus engaged; and the dipping of cuttings before planting in an acidulated Bordeaux mixture containing at least 10 per cent. of copper sulphate.

The writers would be glad to receive specimens of this and of other poplar diseases from as many localities as possible.

BUREAU OF PLANT INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE.

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[5] Ellis, J. B., and Everhart, B. M. North American Fungi. No. 3536. 1898.

[6] Ricker, P. L. Flora of Maine. No. 388. 1898.

## LITERATURE CITED

1. **Delacroix, Georges,** 1903. Sur le parasitisme de Dothichiza populea Sacc. et Briard sur diverses especès de Peupliers. *In* Bul. Soc. Mycol. France, v. 19, fasc. 4, pp. 353–355, 3 figs.
2. ——————, 1906. Une maladie du Peuplier de la Caroline. *In* Bul. Mens. Off. Renseig. Agr. (Paris), t. 5, No. 11, pp. 1355–1363. Also *in* Bul. Soc. Mycol. France, v. 22, fasc. 4, pp. 239–252, 1 pl.
3. **Heald, F. D., and Studhalter, R. A.,** 1914. Birds as carriers of the chestnut-blight fungus. *In* Jour. Agr. Research, v. 2, no. 6, pp. 405–422, 2 figs., pls. 38–39. Literature cited pp. 421–422.
4. **Saccardo, P. A.,** 1884. Sylloge Fungorum . . . v. 3 Patavii.
5. **Studhalter, R. A., and Ruggles, A. G.,** 1915. Insects as carriers of the chestnut-blight fungus. Pa. Dept. Forestry Bul. 12, 33 pp., 4 pls. Literature cited, pp. 28–32.
6. **Voglino, Piero,** 1907. I funghi parassiti delle piante osservati nella provincia di Torino e regioni vicine nel 1906. *In* Ann. R. Accad. Agr. Torino, v. 49, 1906, pp. 175–202.
7. ——————, 1910. I parassiti delle piante osservati nella provincia di Torino e regioni vicine nel 1909. *In* Ann. R. Accad. Agr. Torino, v. 52, 1909, pp. 277–306.
8. ——————, 1911. I nemici del Pioppo canadense di Santena. Nemici vegetali. *In* Ann. R. Accad. Agr. Torino, v. 53, 1910, pp. 325–377, figs. 1–4.

## EXPLANATION OF PLATES

### PLATE CXCIV

FIG. 1. The top of a black poplar affected and killed by *Dothichiza populea.*

Fig. 2. Section of a trunk of a young black poplar recently transplanted, showing a young canker caused by *Dothichiza populea.* The fungus entered through a twig.

Fig. 3. Front view of the canker shown in *f. 2.*

### PLATE CXCV

Fig. 1. Section of the trunk of a black poplar showing an older canker produced by *Dothichiza populea.*

Fig. 2. A canker still older than that shown in *f. 1.*

Fig. 3. A section of the trunk of a black poplar from which the bark has been peeled, showing two browned, dead areas caused by cankers of the fungus.